



# Stream Temperature Monitoring Network

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*Regional Assessment of Past, Present, and Future Salmon Stream Temperatures*

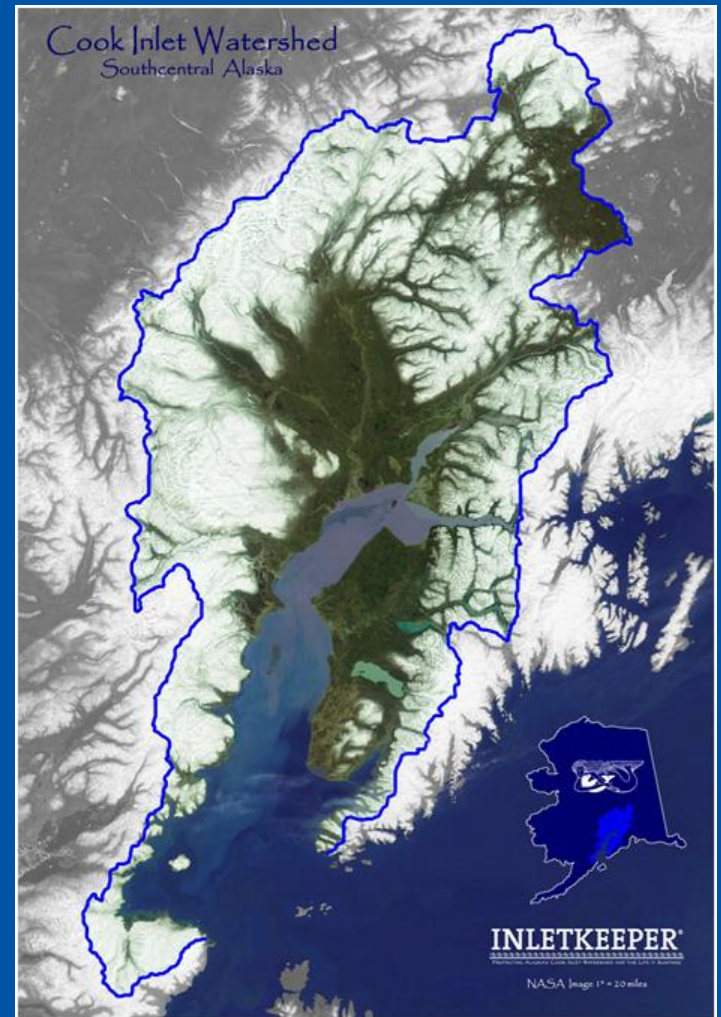
Sue Mauger  
SW AK Science Symposium  
November 3, 2011





# Cook Inletkeeper

- Non-governmental organization with offices in Homer and Anchorage
- Created as part of a settlement for over 4000 Clean Water Act discharge violations into Cook Inlet in the 1990s by Unocal, Shell, and Marathon
- Mission: To protect the Cook Inlet watershed and the life it sustains
- Focused on water quality monitoring and advocacy on issues impacting the watershed





# Outline

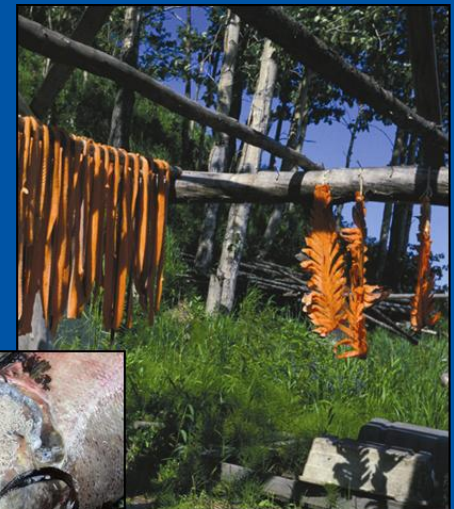
- Present Stream Temperatures
  - Stream Temperature Monitoring Network
- Backcasting
  - Are stream temperatures different now than in the past?
- Forecasting
  - Can we predict future stream temperatures?
- Conclusions



# Present Conditions

## Stream Temperature Monitoring Network

- 1) Collect 5-year water temperature datasets in Cook Inlet salmon streams.
- 2) Identify watershed characteristics with the greatest potential to buffer stream temperatures from climate and land-use change.
- 3) Provide data needed to prioritize sites for future research, restoration and protection actions.







# Where do we monitor?

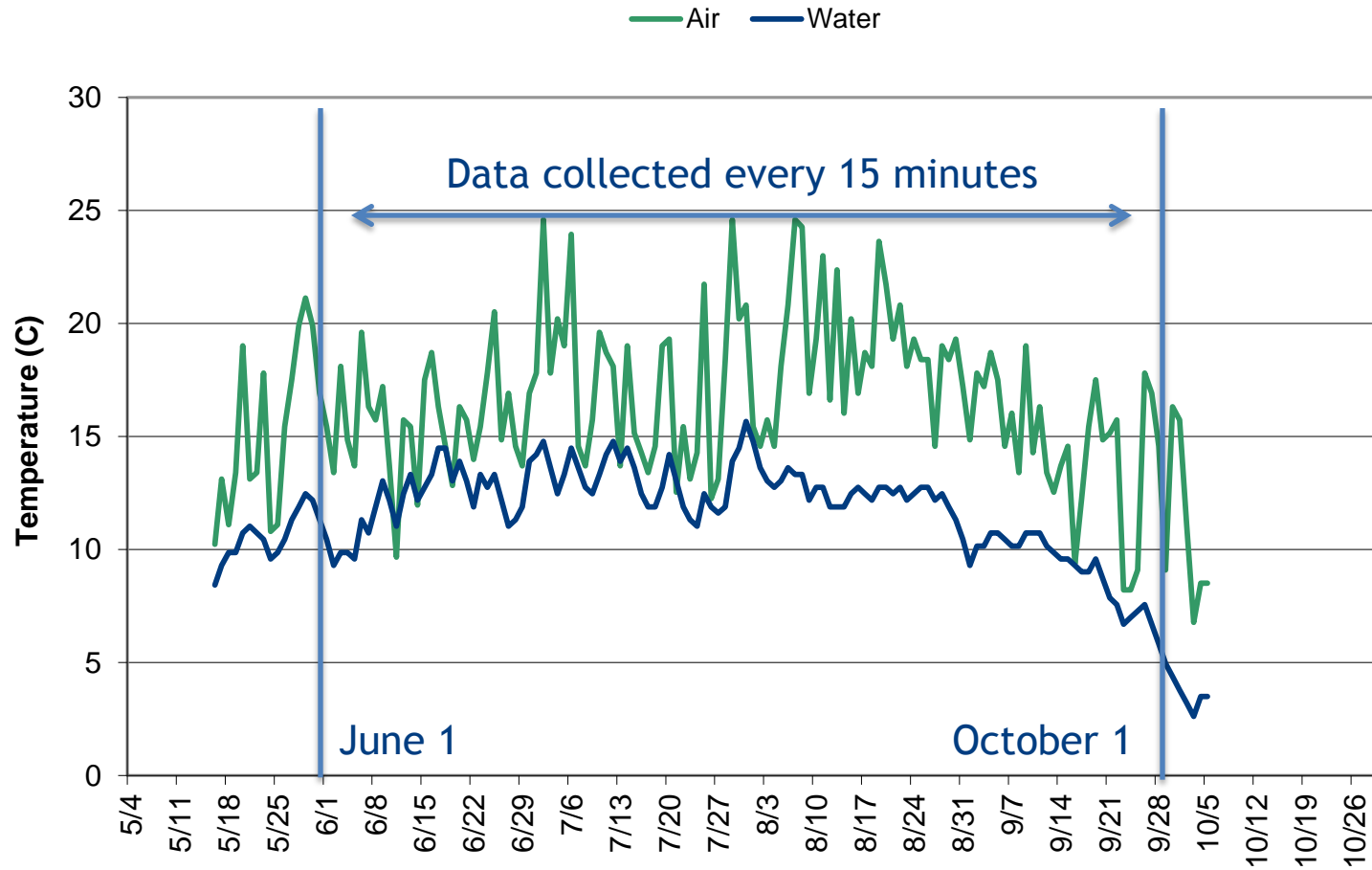


## 48 salmon streams

- minimal glacial influence
- in the Anadromous Waters Catalog
- broad geographic distribution
- large and small watersheds
- clear and brown water systems
- range in landcover types
- reasonable access to lower reach
- QA partner options



# What/When do we monitor?

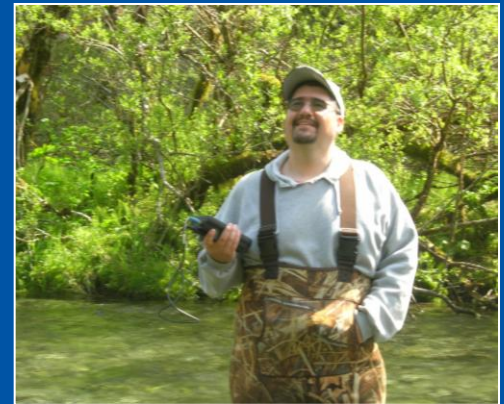


Using standardized protocols

# Partners

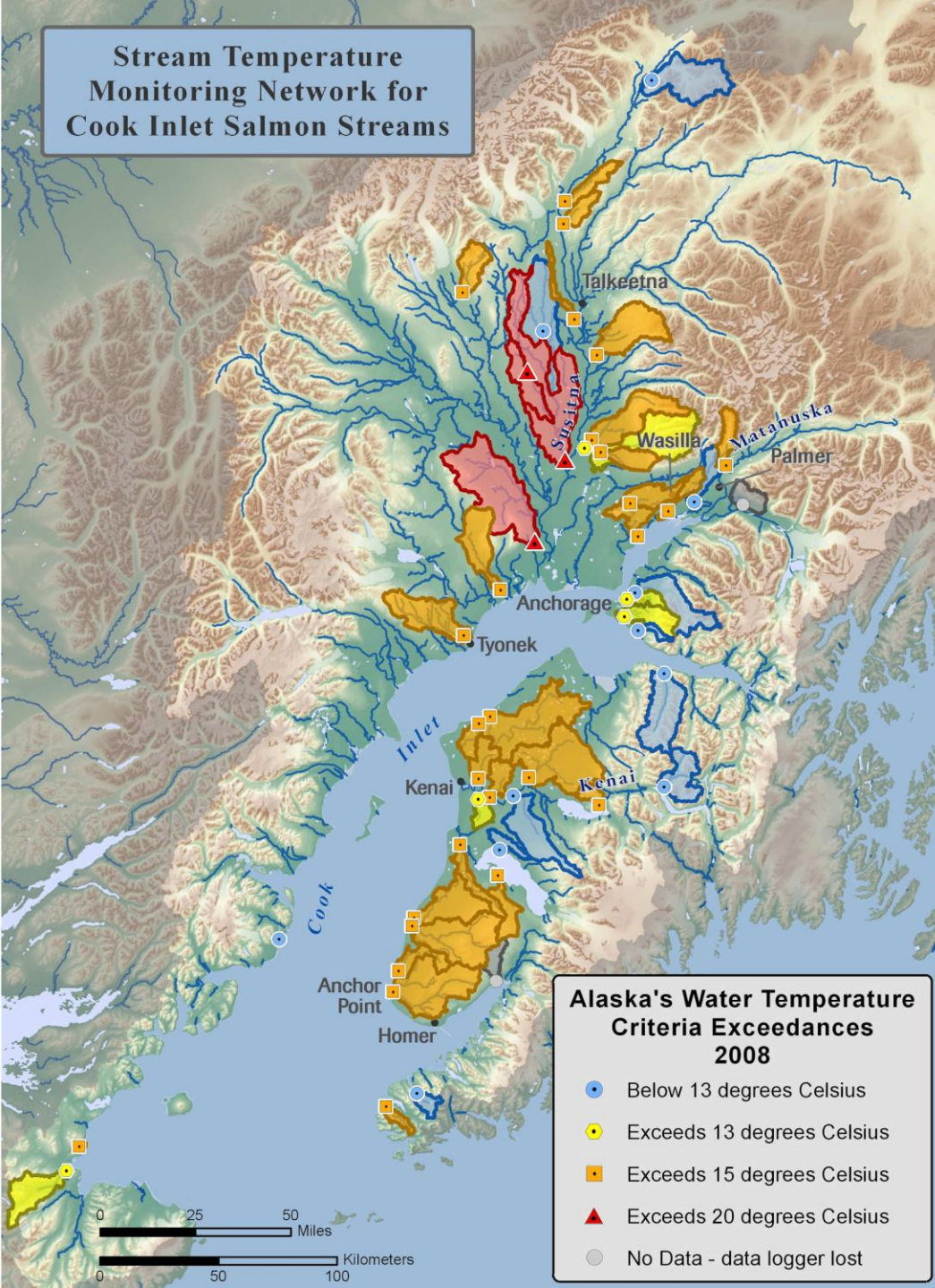
The Nature Conservancy of Alaska  
Kenai Watershed Forum  
Wasilla Soil and Water Conservation District  
Upper Su Soil and Water Conservation District  
Anchorage Waterways Council  
Aquatic Restoration and Research Institute  
U.S. Fish and Wildlife Service  
National Park Service  
U.S. Forest Service  
Alaska Department of Fish and Game  
Native Village of Tyonek  
Seldovia Village Tribe  
Nanwalek Traditional Council  
The Wildlifers  
Denali Trekking Company  
and numerous community volunteers!

Support provided in part by Alaska Clean Water Action grants from Alaska Department of Environmental Conservation, U.S. Fish and Wildlife Service's Coastal Program, Mat-Su Salmon Partnership, Bullitt Foundation, Marisla Foundation, Lawrence Foundation, Wolfensohn Foundation, Skaggs Foundation, Collins Alaska Charitable Trust, and Alaska Conservation Foundation.





# Stream Temperature Monitoring Network for Cook Inlet Salmon Streams



## Alaska's Water Temperature Criteria Exceedances 2008

- Below 13 degrees Celsius
- Exceeds 13 degrees Celsius
- Exceeds 15 degrees Celsius
- ▲ Exceeds 20 degrees Celsius
- No Data - data logger lost

## 2008 Results Maximum Temperatures

13°C  
(55.5°F)



15°C  
(59°F)

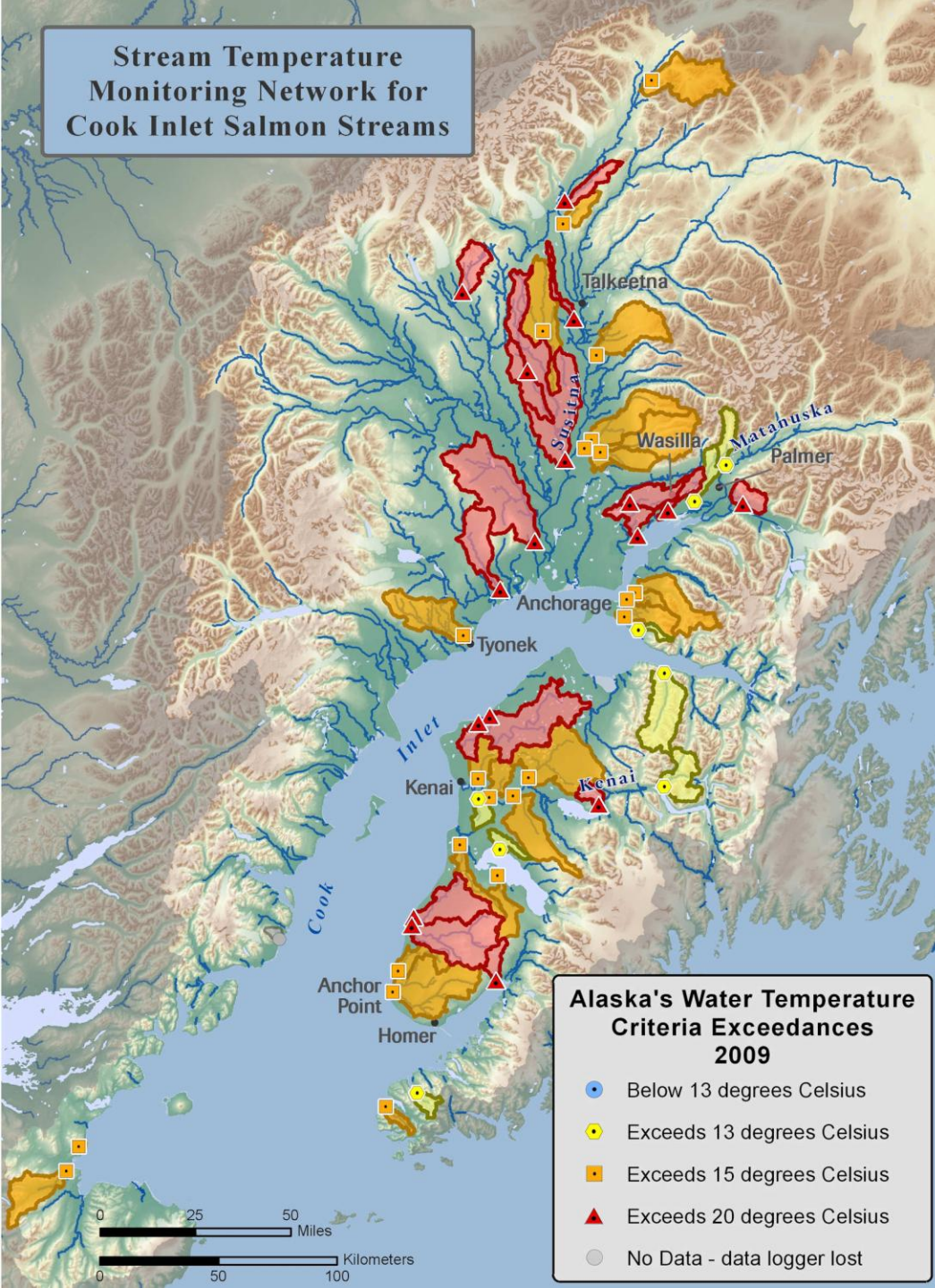


20°C  
(68°F)





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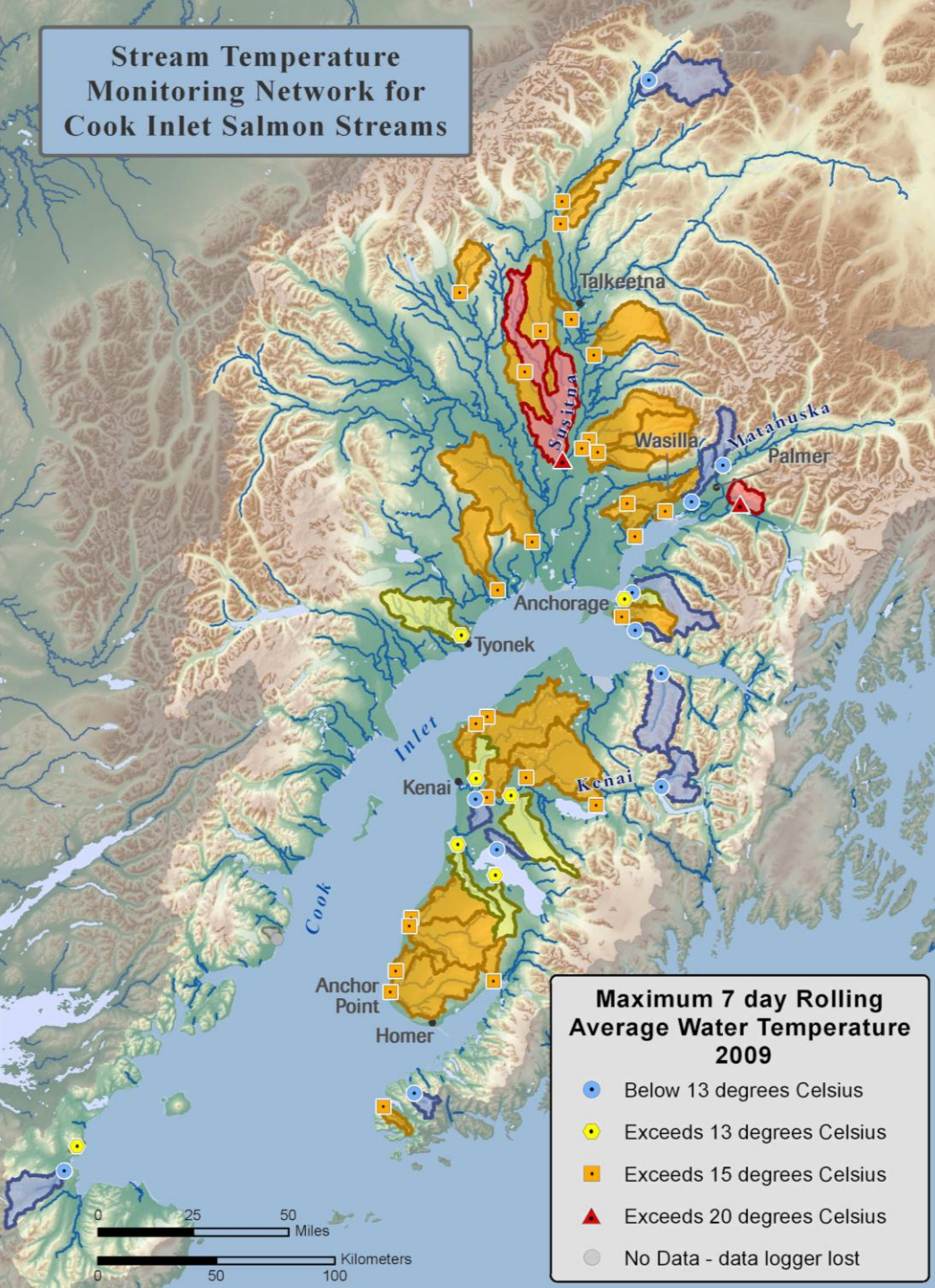


20°C  
(68°F)





Stream Temperature  
Monitoring Network for  
Cook Inlet Salmon Streams



## 2009 Results MWAT

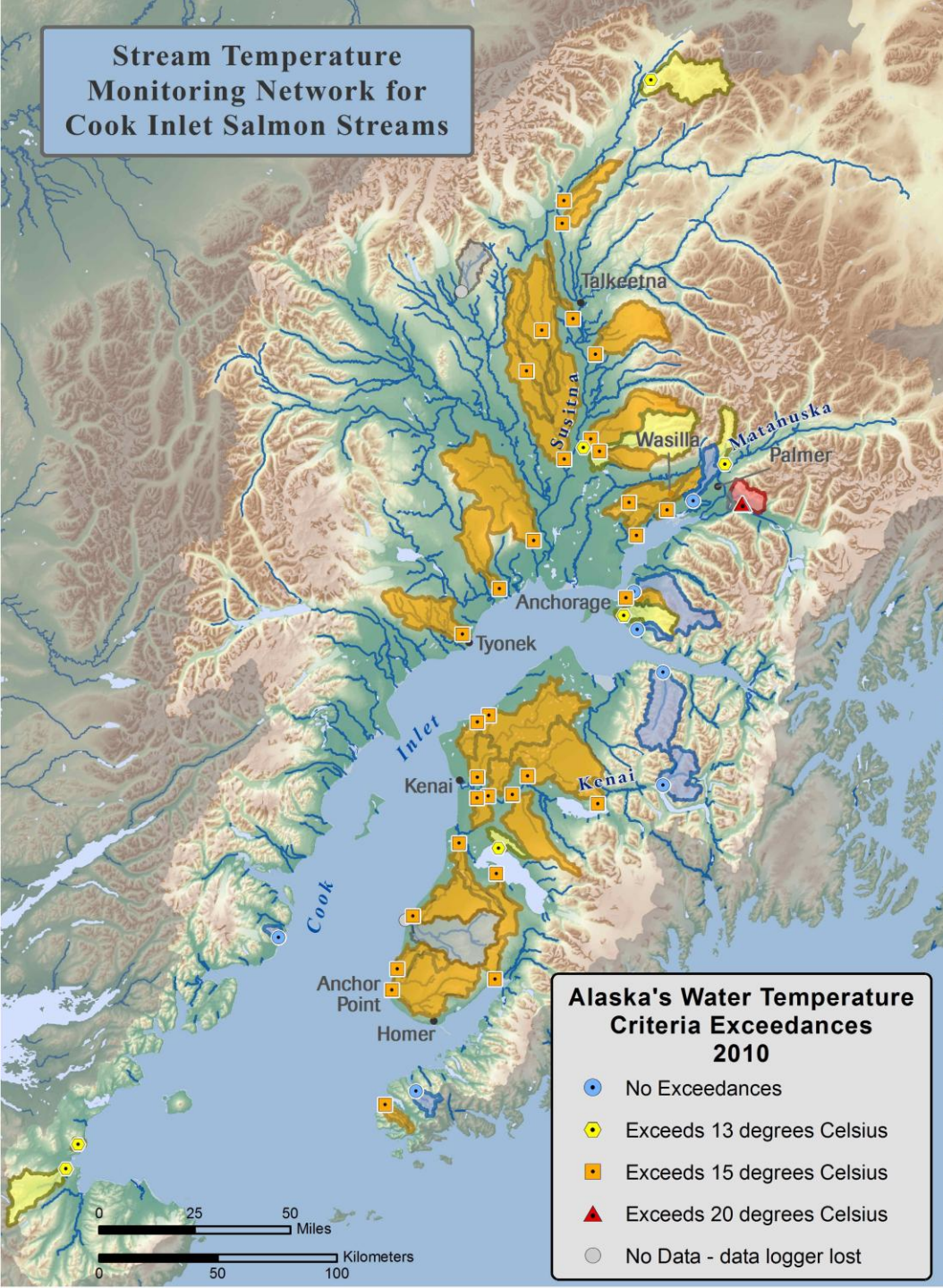
Maximum 7-day rolling  
average water  
temperature

or

Maximum value of daily  
average water  
temperature when  
averaged over seven  
consecutive days



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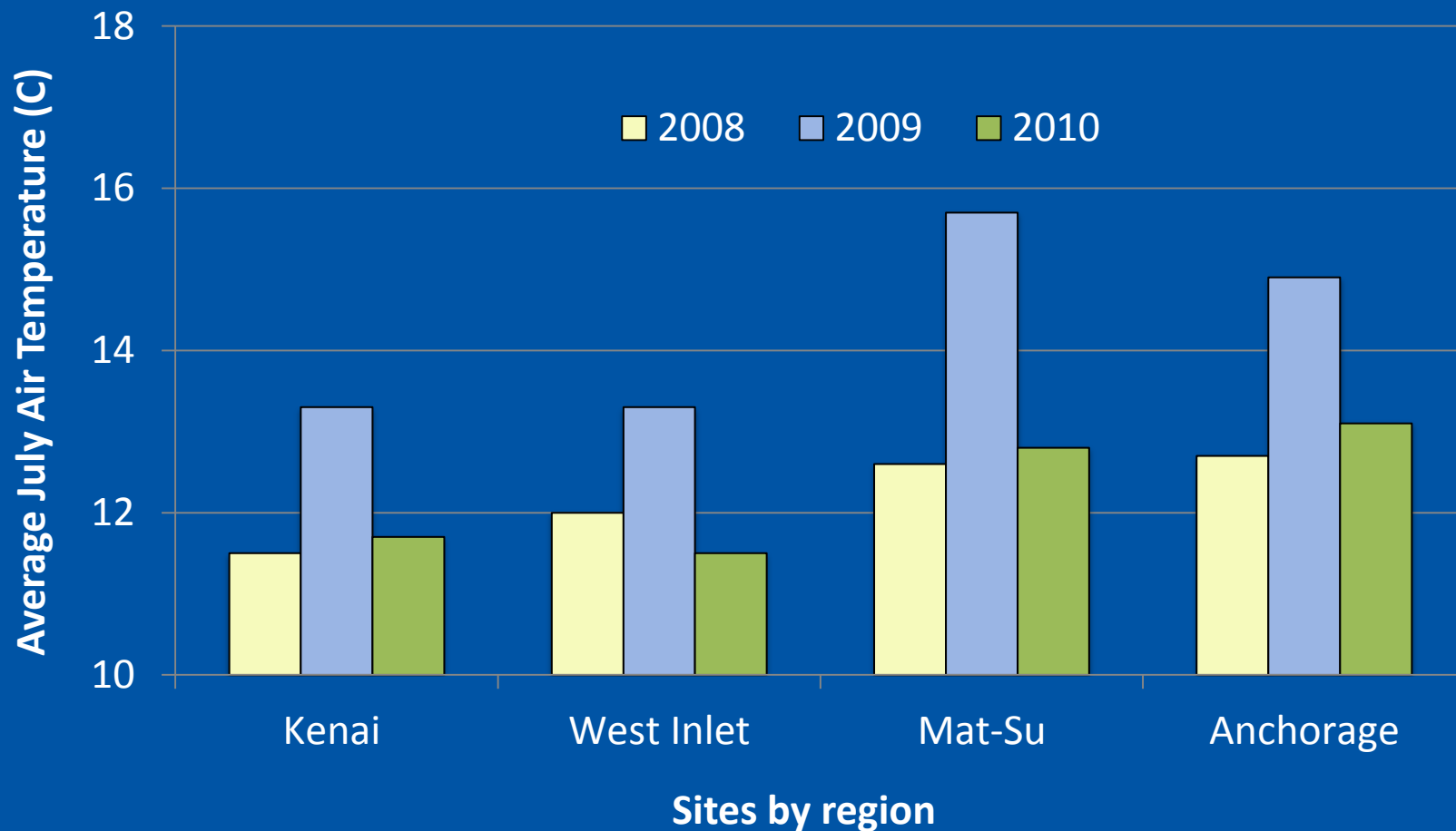
20°C  
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# Air Temperature Patterns

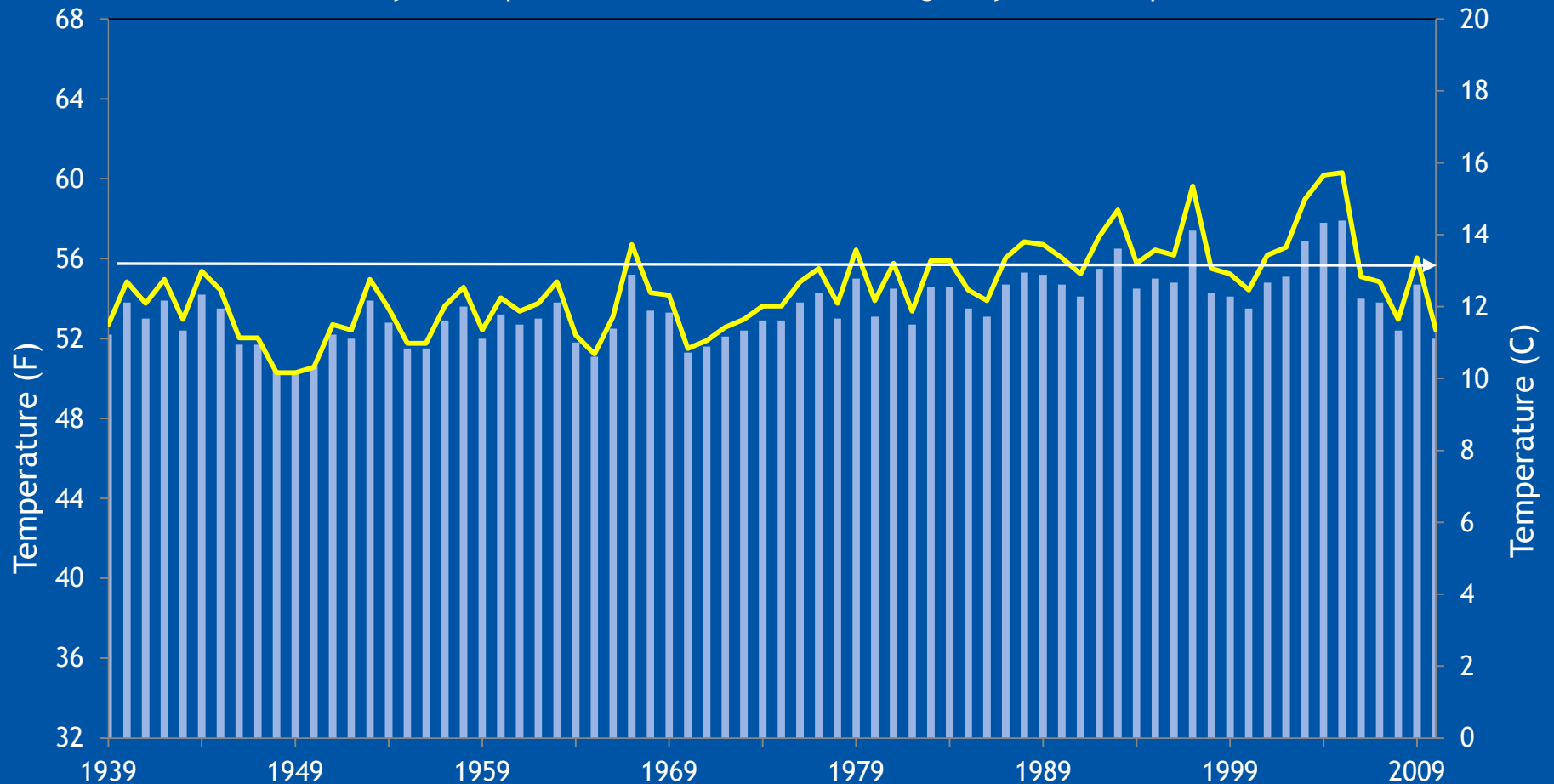


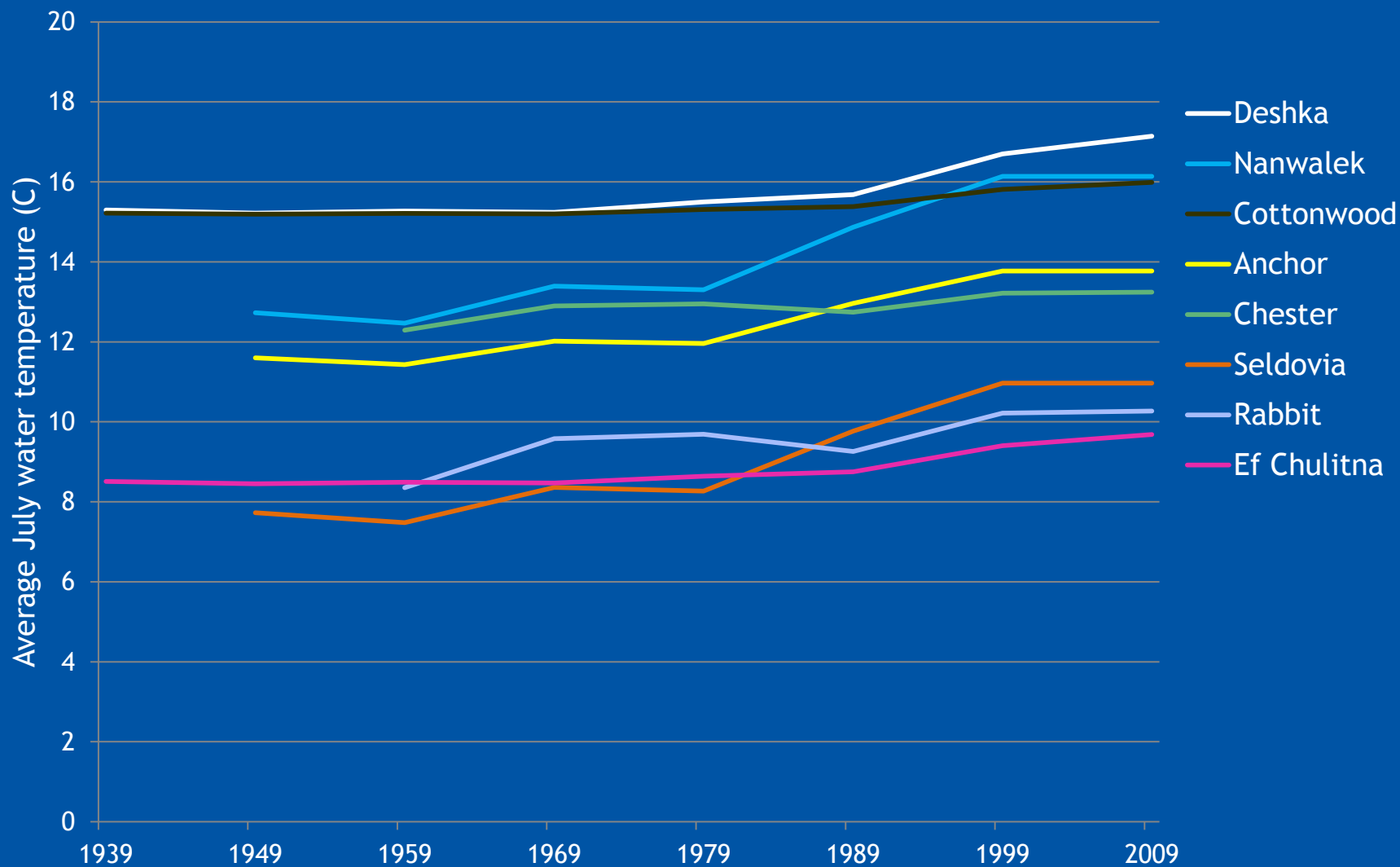


# Backcasting

## Homer Airport - Anchor River

July Air temperature      Predicted Average July Water Temperature





Based on air-water correlations from 2008-2010  
using Talkeetna, Anchorage and Homer Airport data





# Forecasting

- SNAP climate projections are based on the five best-performing Global Circulation Models (GCM's) used by the Intergovernmental Panel on Climate Change (IPCC) identified as a best fit for Alaska
- “A1B” is a mid-range scenario. It assumes a world of very rapid economic growth, a global population that peaks in mid-century and then levels out, rapid introduction of more efficient technologies, and a balance between fossil fuels and other energy sources.
- “A2” is a more pessimistic scenario. It assumes a world with high population growth, slow economic development, and slow technological change.
- Due to variability among models and among years in a natural climate system, such maps are useful for examining trends over time, rather than for precisely predicting monthly or yearly values.
- For more information on the SNAP program, please visit: [www.snap.uaf.edu](http://www.snap.uaf.edu).



# Average July Air Temperature

## Cook Inlet Watershed

### 2010-2019

### A1B Scenario

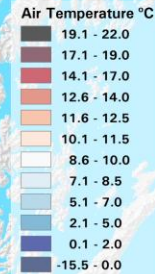
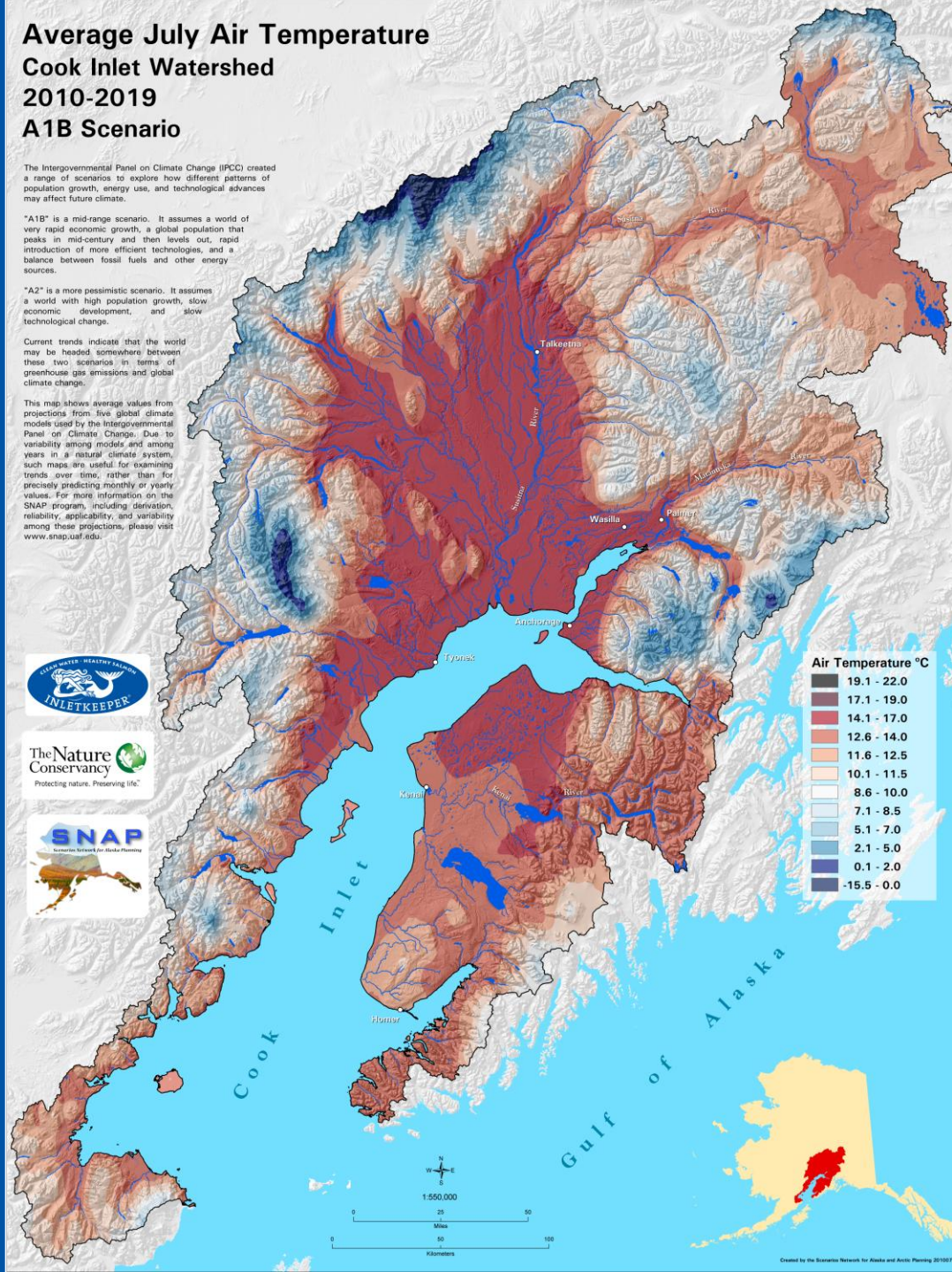
The Intergovernmental Panel on Climate Change (IPCC) created a range of scenarios to explore how different patterns of population growth, energy use, and technological advances may affect future climate.

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Current trends indicate that the world may be headed somewhere between these two scenarios in terms of greenhouse gas emissions and global climate change.

This map shows average values from projections from five global climate models used by the Intergovernmental Panel on Climate Change. Due to variability among models and among years in a natural climate system, such maps are useful for examining trends over time, rather than for precisely predicting monthly or yearly values. For more information on the SNAP program, including derivation, reliability, applicability, and variability among these projections, please visit [www.snap.uaf.edu](http://www.snap.uaf.edu).





# Average July Air Temperature Cook Inlet Watershed 2050-2059 A1B Scenario

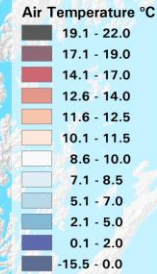
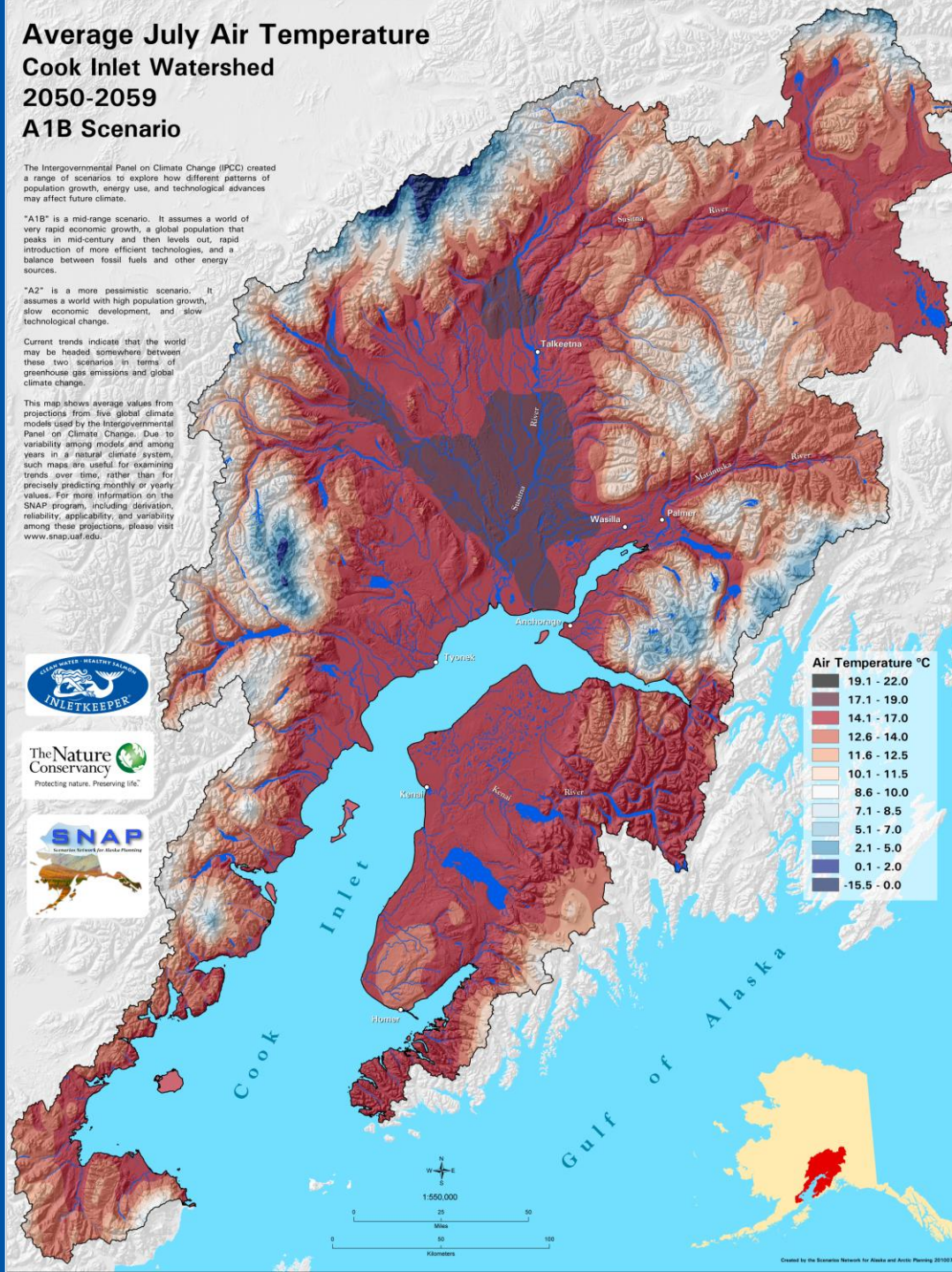
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# Average July Air Temperature Cook Inlet Watershed 2090-2099 A1B Scenario

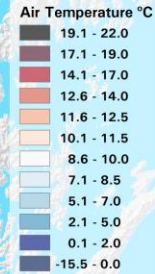
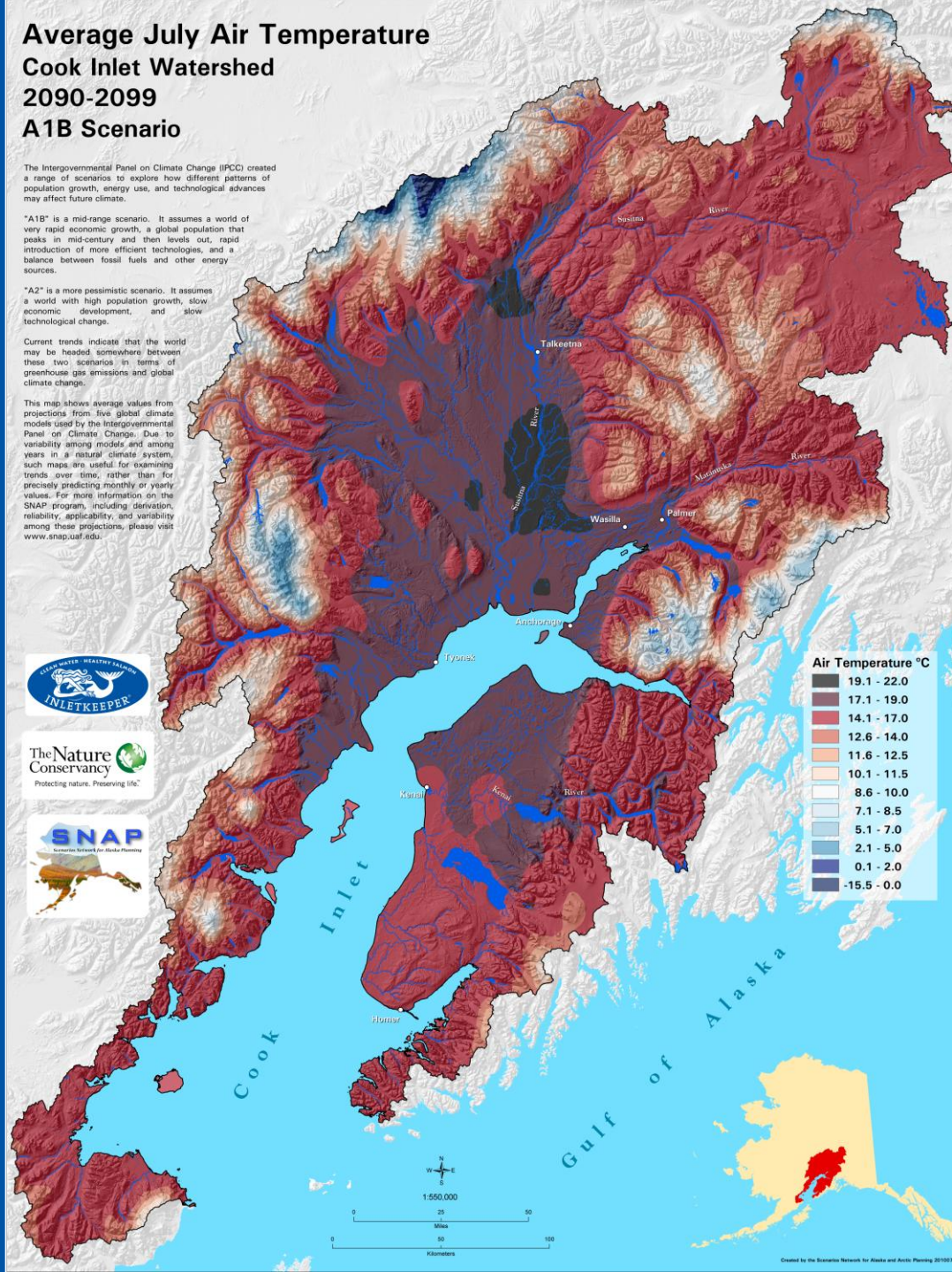
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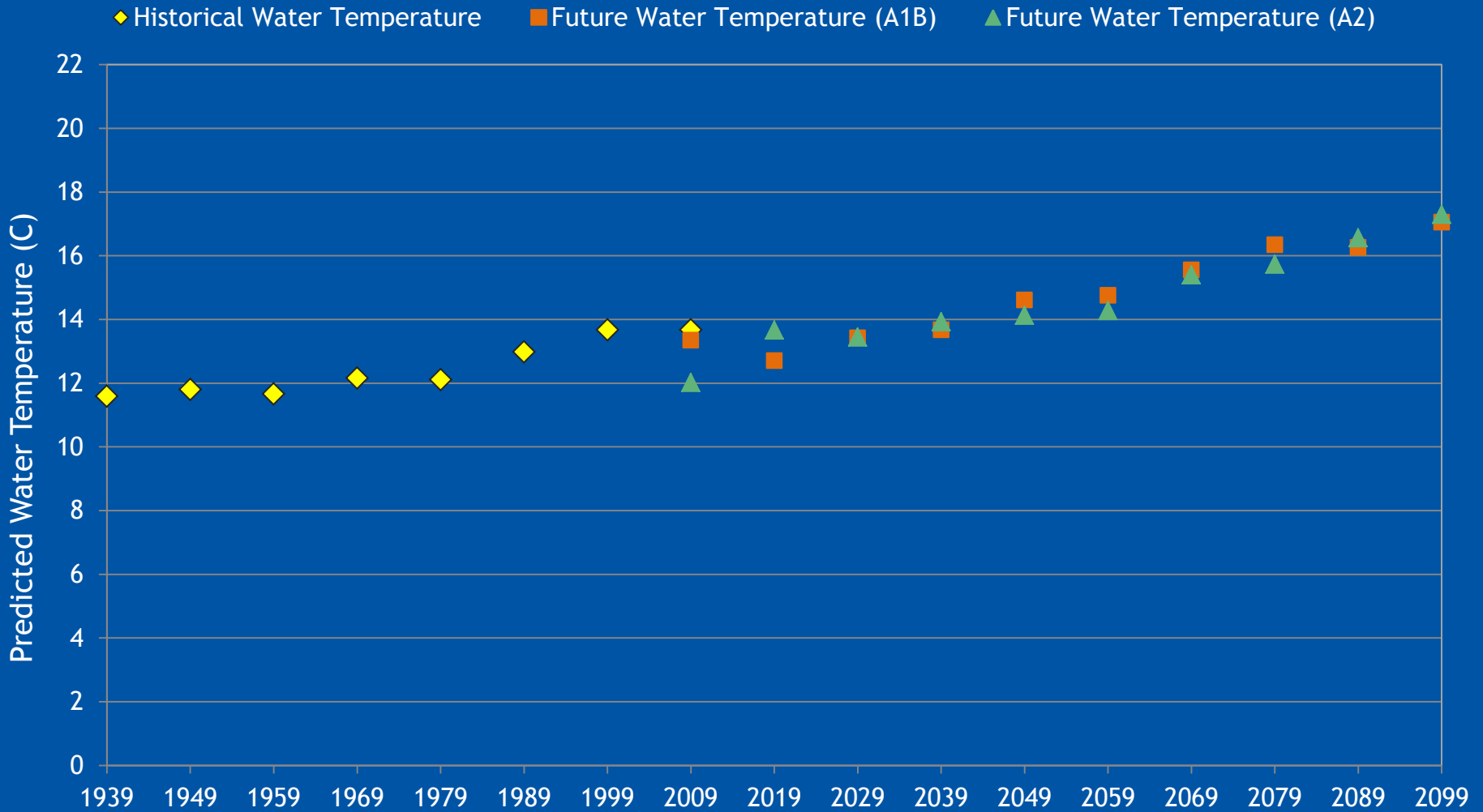
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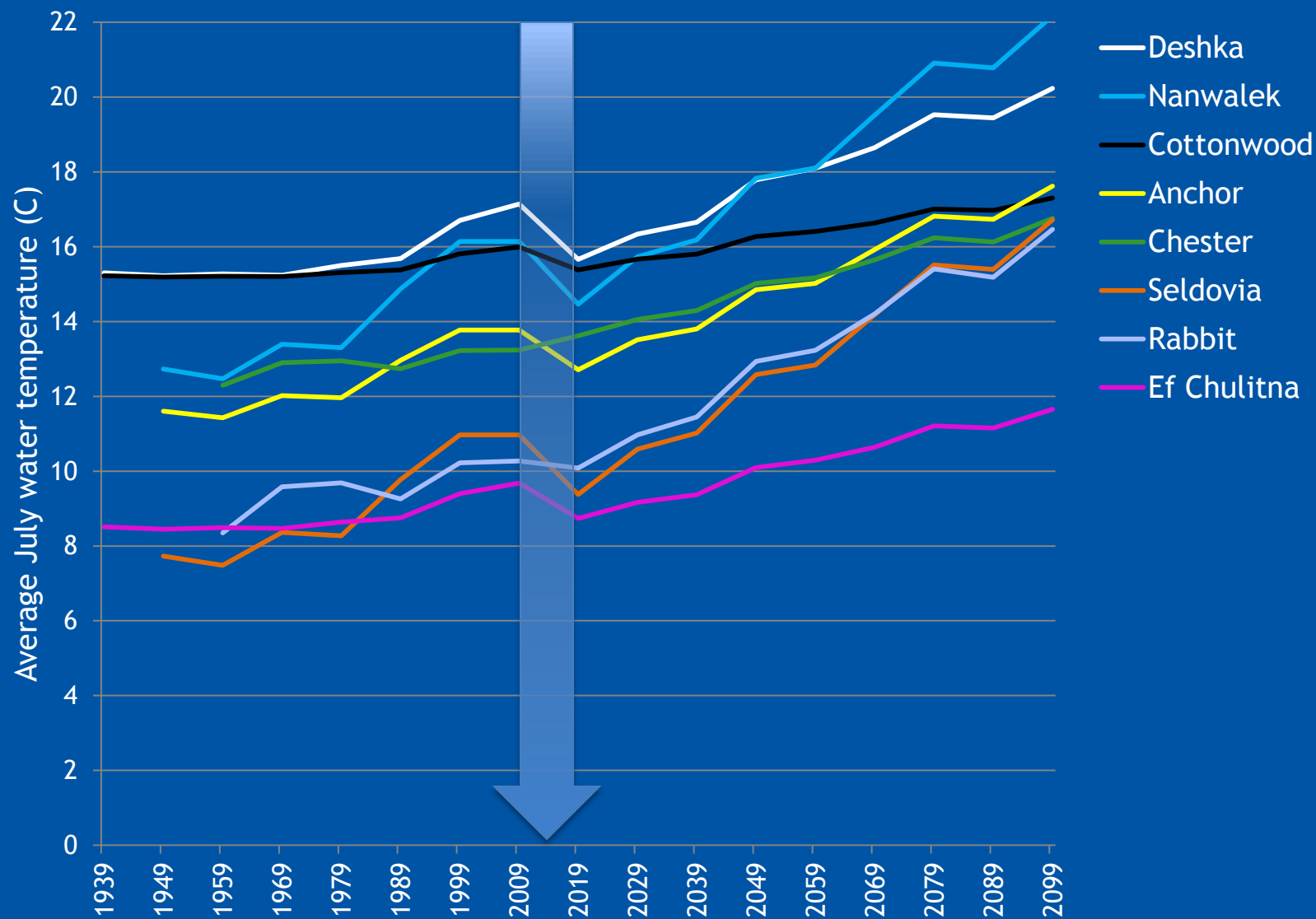
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# Homer Airport - Anchor River



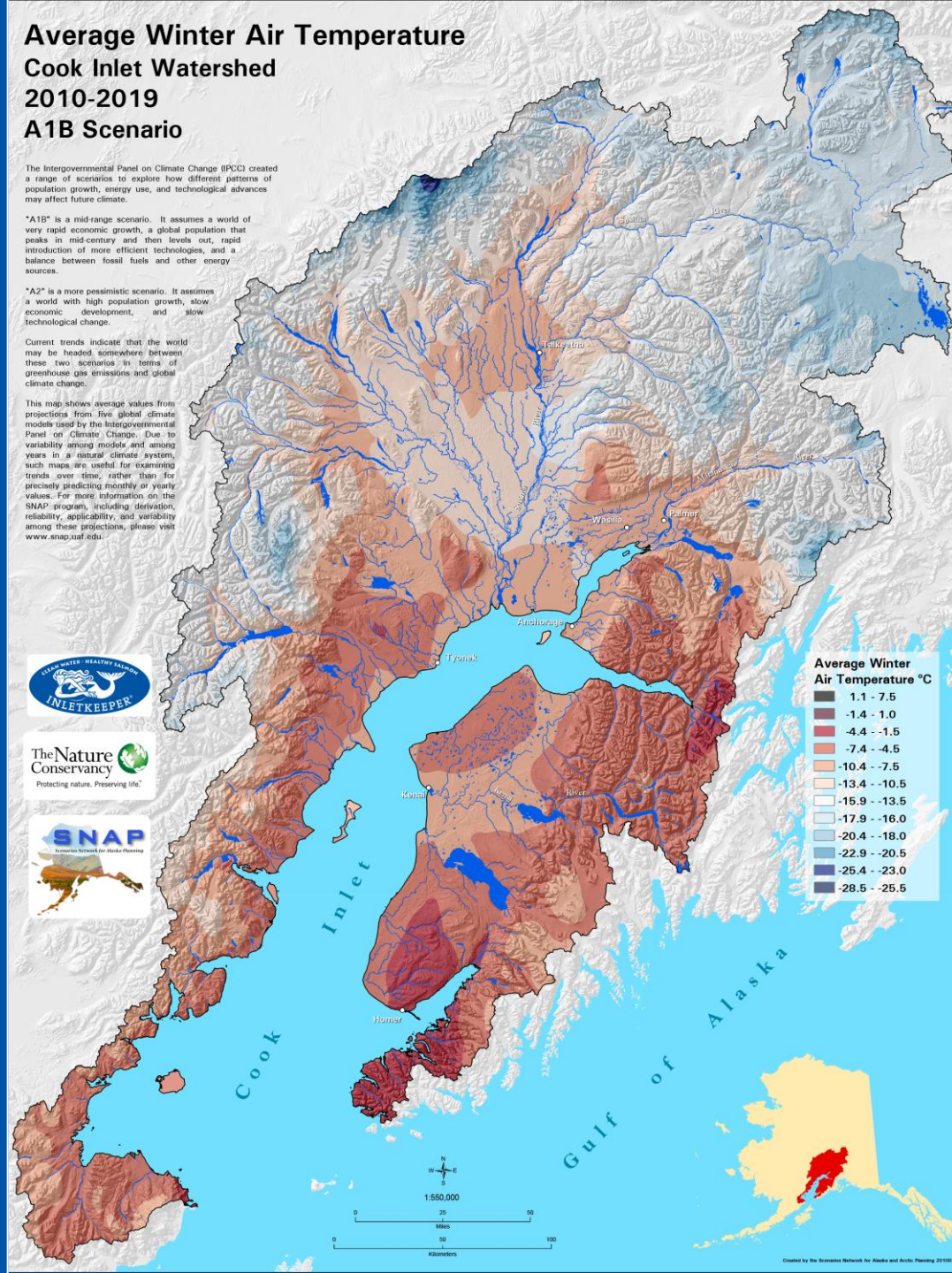


Based on A1B scenario



**Average Winter Air Temperature °C**

1.1 - 7.5
-1.4 - 1.0
-4.4 - -1.5
-7.4 - -4.5
-10.4 - -7.5
-13.4 - -10.5
-15.9 - -13.5
-17.9 - -16.0
-20.4 - -18.0
-22.9 - -20.5
-25.4 - -23.0
-28.5 - -25.5





# Average Winter Air Temperature Cook Inlet Watershed 2050-2059 A1B Scenario

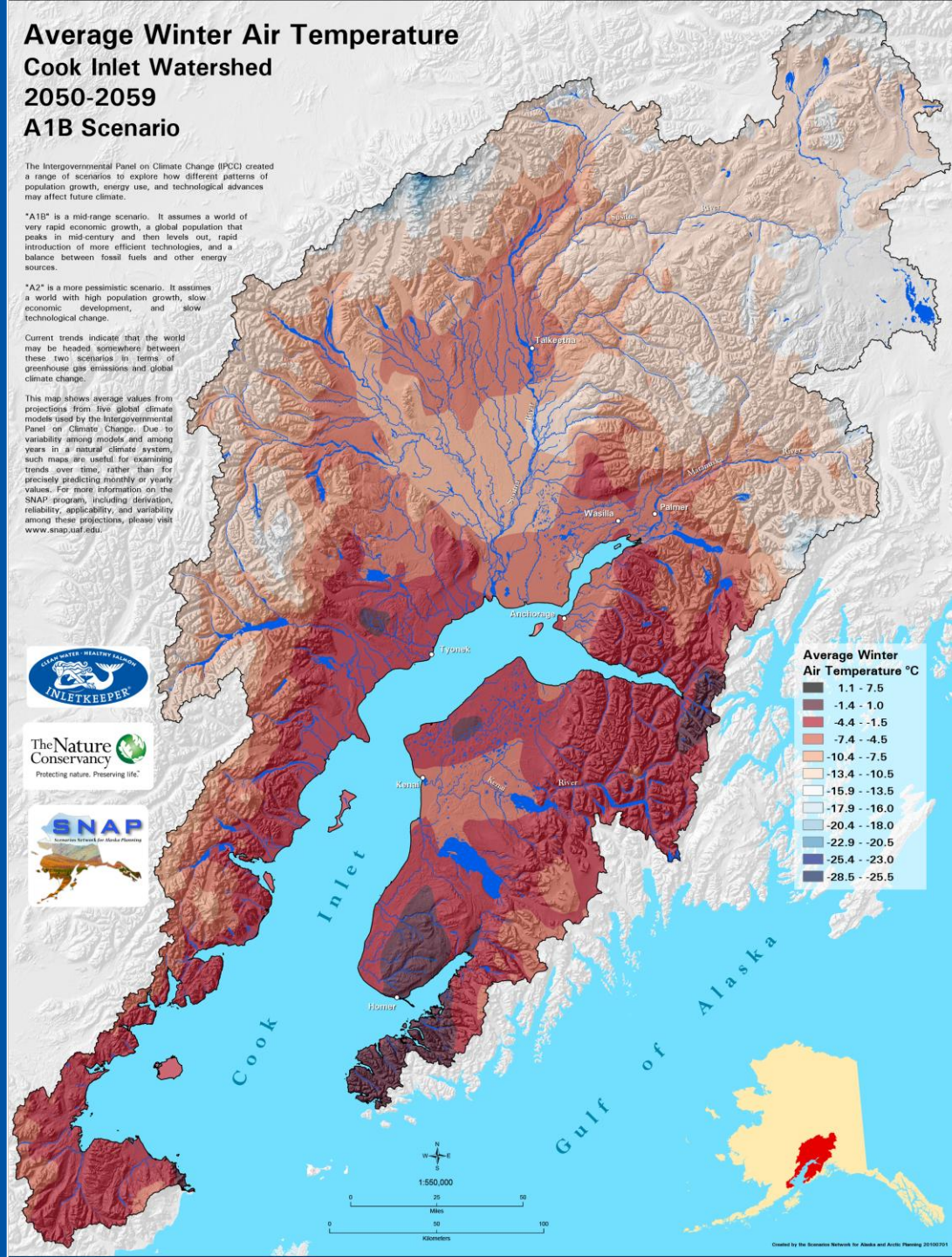
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# Average Winter Air Temperature

## Cook Inlet Watershed

### 2090-2099

### A1B Scenario

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# Conclusions

- Stream temperatures are warmer now than in the past based on relationship with historic air temperatures in Cook Inlet.
- Stream temperatures are likely to continue to warm and increase thermal stress to salmon.
- Increases in winter air temperatures may be as significant, if not more so, than changes in summer air temperatures.
- This collaborative, multi-partner network is effective for collecting and managing temperature data at a regional scale.



# Questions?

**Sue Mauger**

**907 235-4068, x24**

**[sue@inletkeeper.org](mailto:sue@inletkeeper.org)**

**[www.inletkeeper.org/healthy-habitat/stream-temperature-monitoring-network](http://www.inletkeeper.org/healthy-habitat/stream-temperature-monitoring-network)**

